

# **2007 Forest Management Summary Report**

**City of Boulder Open Space and Mountain Parks  
and  
City of Boulder Fire Department**



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*Cover photos: This pair of photos shows the same location in the Flagstaff Road project area before and after thinning activities conducted in 2007.*

## **EXECUTIVE SUMMARY**

The 2007 field season was the fourth consecutive year Open Space and Mountain Parks (OSMP) committed full time resources to the implementation of the Forest Ecosystem Management Plan. In total, 136 10 hour days were spent on forest management by the OSMP crew between April 3 and November 30, 2007. One hundred and fifteen forest acres were treated in 2007; more than in any previous year. The field season also included collaborative efforts with the City Fire Department, a dramatic increase in wildlife and vegetation monitoring, and continued data modeling, mapping, and analysis.

## **BACKGROUND**

In June of 1999, the City Council approved part one of the City of Boulder Forest Ecosystem Management Plan (FEMP). The plan established a framework, policy guidelines, and management direction for forest ecosystem management on city lands. The goals of FEMP are to:

- Maintain or enhance native plant and animal species, their communities and the ecological processes that sustain them
- Reduce the wildfire risk to forest and human communities

## **FOREST MANAGEMENT PROGRESS**

During the period 1999 -2003 a lack of equipment and minimal staffing reduced the effectiveness and efficiency of forest management on OSMP lands. Most wood skidding and removal was dependent on private contractors. In many cases using contractors resulted in increased expenses, increased resource damage, and increased staff time because of logistical and planning issues. In the past three years, OSMP has acquired a new chipper and tractor dramatically improving the efficiency of projects and reducing reliance on contractors.

Prior to 2004, forest management on OSMP lands was solely dependent on the City Fire Department fire mitigation crew and occasional help from OSMP staff. In 2004 OSMP hired its first full time seasonal forest management crew of four. Although the Fire mitigation crew was fully staffed, they were unable to devote significant time to OSMP projects in 2004. In 2005 OSMP and Fire staff developed the first Service Level Agreement (SLA) to define the annual work plan for both the OSMP and Fire crews. The use of the SLA and crew coordination continued in 2006 and 2007.

Forest management on OSMP has made a shift over the past years from doing smaller, partial projects to larger complete projects (Figure 1). This shift can be attributed to better equipment, broader scale planning, and more committed staff time. Large complete projects are much more efficient because less time is spent on layout and logistics and there is no follow-up work for future seasons. Larger projects also have ecological benefits. Impacts are greatly decreased by doing one large project instead of a series of smaller ones (one access road, one pass with the

skidder, etc.). Large projects also have a more dramatic impact on the landscape by increasing habitat for wildlife and understory plants, increasing vigor and health of entire stands of trees and by decreasing the threat of large catastrophic fire events.

The efficiency and effectiveness of forest management on OSMP lands has steadily increased since the seasonal OSMP crew was added in 2004. The 2007 season marks the third consecutive increase in treated acreage since 2004.

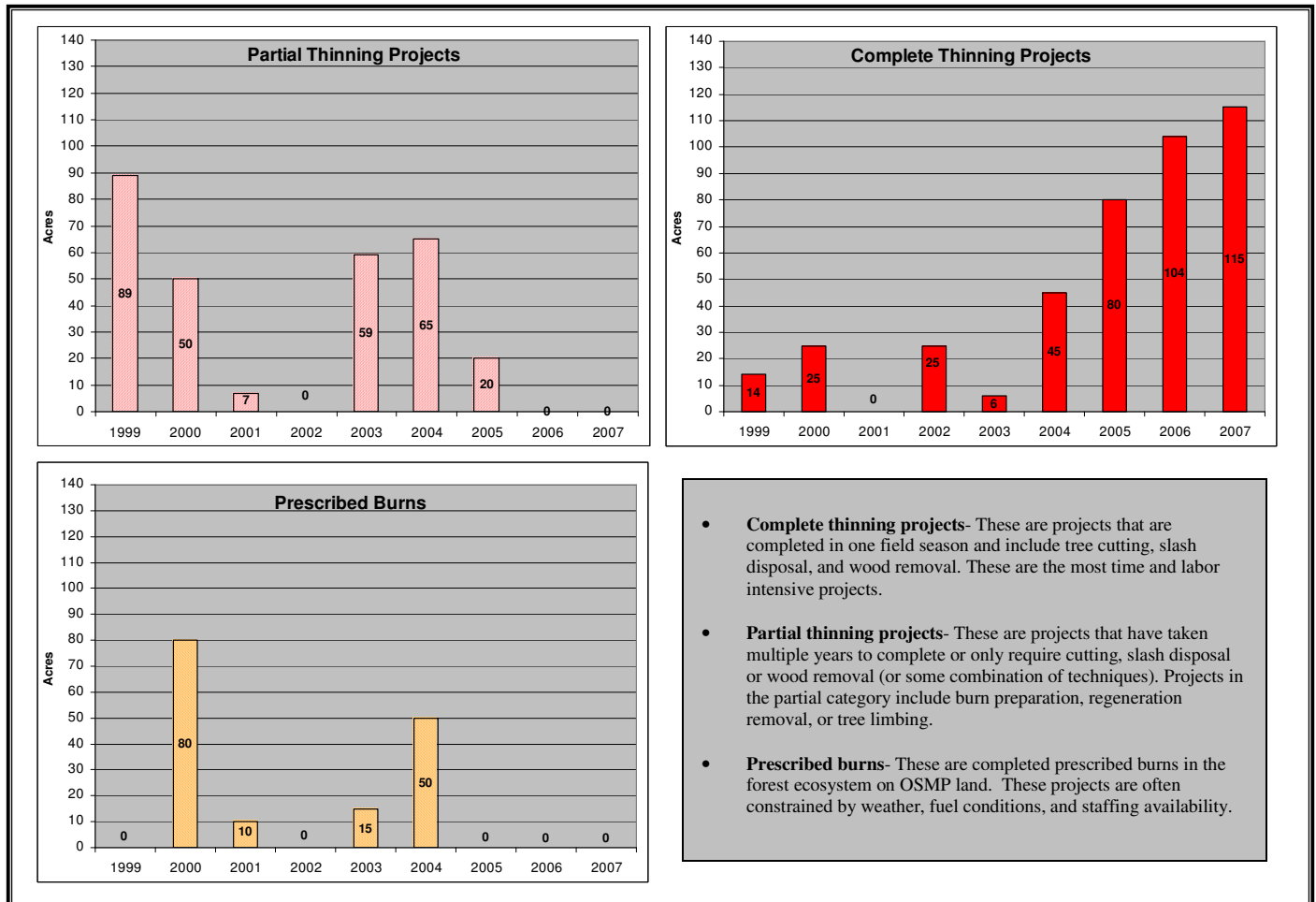


Figure 1: Annual FEMP progress

### Major Forest Management Projects by Year:

**2007:** Flagstaff Road Corridor, Pinebrook Fuel Break, Marshall Mesa

**2006:** LJC-NE, Marshall Mesa, LJC-SE

**2005:** Lindsay South, Olson/McIntosh, Daman, Enchanted Mesa Reservoir, Lindsay Road

**2004:** S3 Cutting and Skidding, McIntosh, Conda Meadow, Watertank/FLVI Burn Prep, Lindsay Meadow Burn

**2003:** S3 Cutting, Volunteer Regen Cutting, Conda Meadow, Lindsay North Burn (3)

**2002:** ST3, Shanahan/Devils Thumb Neighborhood Thinning

**2001:** Lindsay North Burns (1, 2), Wittemyer Fuel Break

**2000:** Lindsay North, Enchanted Mesa, Shanahan Burn

**1999:** Lindsay North, Enchanted Mesa, Flagstaff Top Shop

## 2007 FOREST MANAGEMENT CREW

Most of the implementation of the Forest Ecosystem Management Plan is carried out by a dedicated and hard working seasonal crew. In 2007 the crew consisted of 4 members that worked from April 3 to November 30. The crew spent a total of 136 work days on various OSMP projects with the emphasis on forest thinning (Figure 2).

In addition to working on thinning, the OSMP forest crew spent time on a number of other departmental priority projects. The crew helped complete a number of projects outlined in the Visitor Master Plan including closing and restoring social trails around Lindsay pond and helping establish wildlife monitoring plots in the Eldorado/ Doudy Draw Trail Study Area. A number of days were also spent on other OSMP projects including Russian olive removal, clean-up of downed trees on fences and removal of hazard trees

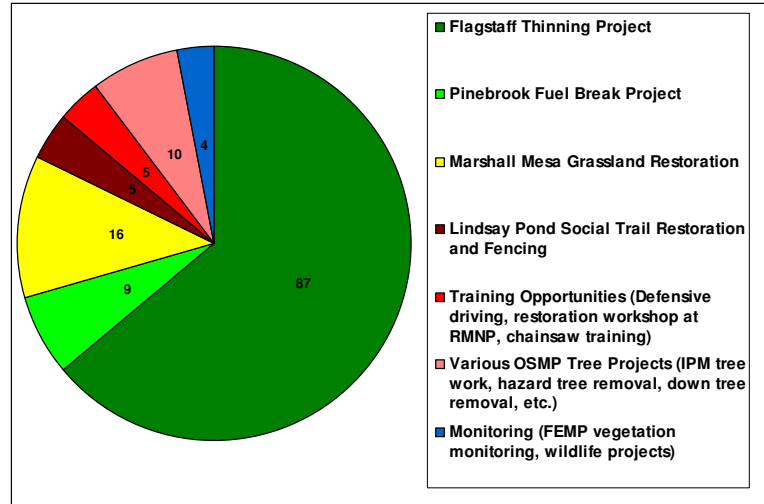


Figure 2: Time spent on 2007 projects by the OSMP forest crew (in days)

The OSMP crew also received help on thinning projects from the City Fire Department's seasonal mitigation crew. Coordination between the crews was outlined in the 2007 Service Level Agreement (Table 1). The Fire crew spent 18 days on OSMP thinning projects in 2007. The Fire crew is also an essential part of prescribed fire operations and planning. In 2007, Fire staff helped plan for over 100 acres of prescribed burning on OSMP property. The Fire department was responsible for and completed smoke permitting, collaboration with local fire districts, resource coordination, collaboration on burn plan development and staff training. Over a week was spent by the Fire crew doing on-the-ground preparations for the S-3 burn. The burn was cancelled due to unfavorable weather conditions but much of the prep work will carry over to the 2008 burning season.

Table 1: SLA defined projects

Project	Date Completed	Notes
<b>Thinning Projects</b>		
Flagstaff Road	September 12	Completed 83 acres
Lindsay Jeffco-SE	Incomplete	Cancelled due to wildlife monitoring in the area
<b>Forest Burns</b>		
S-3	Incomplete	Cancelled due to weather conditions, rescheduled for Spring 2008
Watertank (two units)	Incomplete	Cancelled due to fuel conditions, rescheduled for Spring 2008



## **2007 THINNING PROJECTS**

A total of 112 days were spent by the OSMP forestry crew and 18 days by the Fire crew on thinning projects in 2007. The crew also benefited from the help of Americorp and jail crews. Twelve days were spent working with Americorp and jail crews which usually included 8 to 12 individuals. A total of 115 acres were thinned in three projects during the 2007 season.

### **Flagstaff Road**

The Flagstaff Road thinning project followed along the north and south sides of the road from Realization Point to the western side of Cathedral Park (upper Long Canyon trail). A total of 87 days were spent on this project between April 11 and September 6. The project area covered a total of 83 acres and included cutting, chipping on-site, skidding and wood removal.

This project was designed to enhance the landscape level fuel break created by Flagstaff Road. The secondary goals were to create defensible space around OSMP structures, enhance Flagstaff road as a potential escape route, and restore more natural forest conditions. Prior to treatment the area was dominated by large patches of very heavy Douglas-fir regeneration (Figure 3). Historic photos of the area show an increase in density from the earliest photos (1940) to the 1970's. Between 1971 and 1982 the tree density in the area dropped dramatically. This density drop coincides with the Greenslope thinning done in the late 1970's to control a massive bark beetle outbreak. The current conditions probably represent a flush of regeneration resulting from a more open canopy and disturbed soil after the historic thinning. In many patches 70% of the trees are in the seedling and sapling size classes with an average age of 20 years.

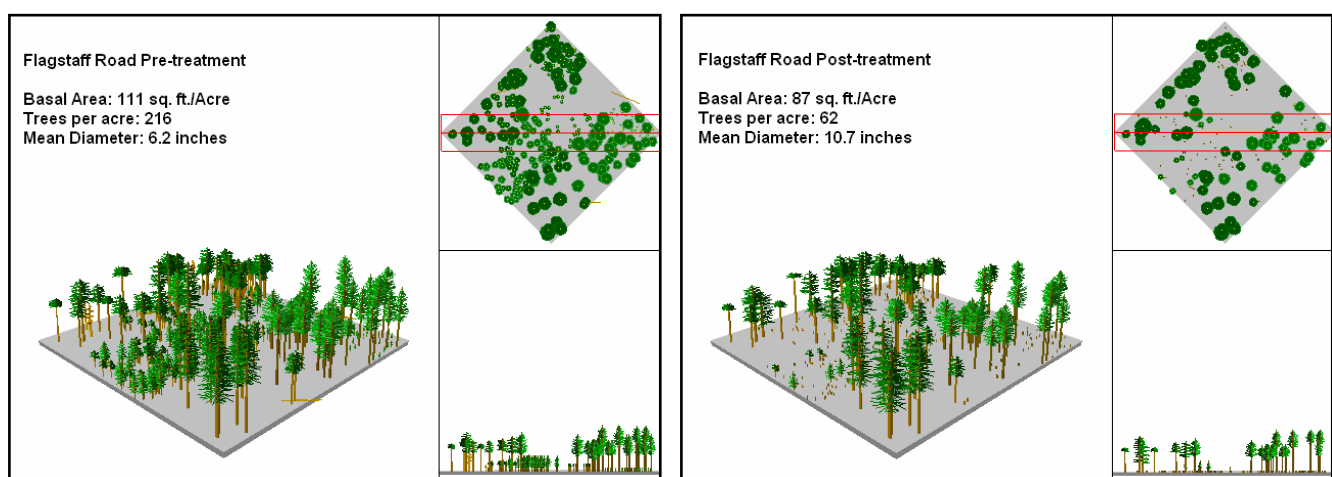


Figure 3: Flagstaff overstory structure change due to treatment

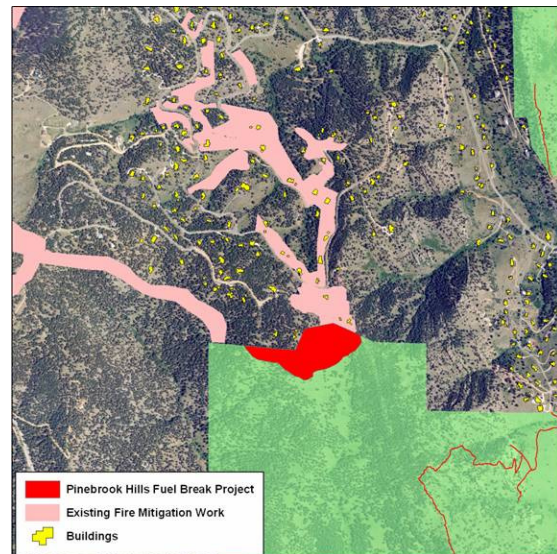
Thinning along Flagstaff road was focused on removing the heavy regeneration and breaking up the continuous canopy fuels. Large natural openings like Cathedral Park create fuel breaks and wherever possible thinning also focused on enhancing and enlarging these natural openings. On average, the treatment created 15 foot canopy spacing and removed 70-90% of the heavy Douglas-fir regeneration under 7" dbh. Canopy cover decreased from an average of 35% to 20%. Basal area was decreased by 21% and the tree density went from 216 trees per acre to 62. The area is now a mosaic of habitats with some dense islands remaining among more open meadows and savannahs.

### **Lindsay Jeffco-SE**

The LJC-SE project was planned for August through November and was a part of the 2007 Service Level Agreement. This area was part of the Eldorado/ Doudy Draw Trail Study Area planning process that started in 2006 and continued in 2007. There were no new trails planned in or near this stand but it was identified as an ideal area for wildlife monitoring. The LJC-SE stand was chosen as a control site for ungulate monitoring because of its lack of trails and limited human use. Fifty pellet plots were established in the stand in July of 2007. The thinning in this area was postponed indefinitely due to the monitoring. Once new trail construction is complete in the area the thinning will be rescheduled.

### **Pinebrook Hills Fuel Break**

The Pinebrook Hills fuel break is located on the northern edge of the Wittemyer Property and just northwest of the Sanitas Mountain summit. The treatment area is directly adjacent to the Pinebrook Hills neighborhood and ties into work that has been completed nearby (Map 1). This project was a collaborative effort between OSMP, the Pinebrook home owners association, the Colorado State Forest Service, and Boulder Mountain Fire. All of these groups were involved in planning the project, securing access, and making treatment recommendations.



**Map 1: Pinebrook treatment area and surrounding projects**

The OSMP crew spent a total of 9 days on this project between September 24 and October 10.

The project covered about 12 acres and was primarily focused on the removal of ladder fuels and some small diameter trees. The access in this area was limited to foot traffic and the use of the chipper and tractor was not possible. All the biomass generated by this project was piled and will be burned at a later date.

The overall changes in forest structure on this project were minimal. Since few large trees were removed, there was no measurable change in basal area and a slight decrease in trees per acre. The primary change was the canopy base height (average height of the lowest branches) was increased from 0 feet in some areas to 6+ feet across the stand. Most of the ladder fuels were

removed and a continuous fuel break has been created that ties into natural breaks and adjacent mitigation work.

## Marshall Mesa Grassland Restoration

The Marshall Mesa grassland restoration project is an on-going treatment that was started in 2006. In 2007 the thinning was part of a collaborative volunteer effort with Wildlands Restoration Volunteers (WRV). WRV is a local non-profit group that focuses on bringing people



together to restore and protect natural lands across the state. OSMP worked with WRV to design a full day volunteer project that was focused on ecosystem restoration. Marshall Mesa was chosen because of the ease of access, the ecological benefits, and the large amount of work. OSMP staff worked with WRV staff and volunteers to lay out the project, recruit volunteers, and coordinate all the logistics of the event.

Over 100 volunteers attended the project on October 13. Volunteers used hand saws and loppers to cut small diameter trees and pile slash for later chipping. The project area covered 20 acres. After the initial volunteer project the OSMP crew spent an additional 16 days cutting and chipping between October 16 and November 20.

This area on Marshall Mesa is part of a larger grassland matrix. Over the past 60-80 years Ponderosa pines have been slowly encroaching into the grasslands and shading out portions of the understory. This project was focused on restoring more open grasslands and removing a large percentage of the trees. Prior to thinning, the stand had a basal area of 60 sq. ft./acre. There were 281 trees per acre with 90 % of the trees smaller than 8 inches in diameter. The goal of the thinning was to remove 70-80% percent of the trees in the stand and re-introduce fire in the future.

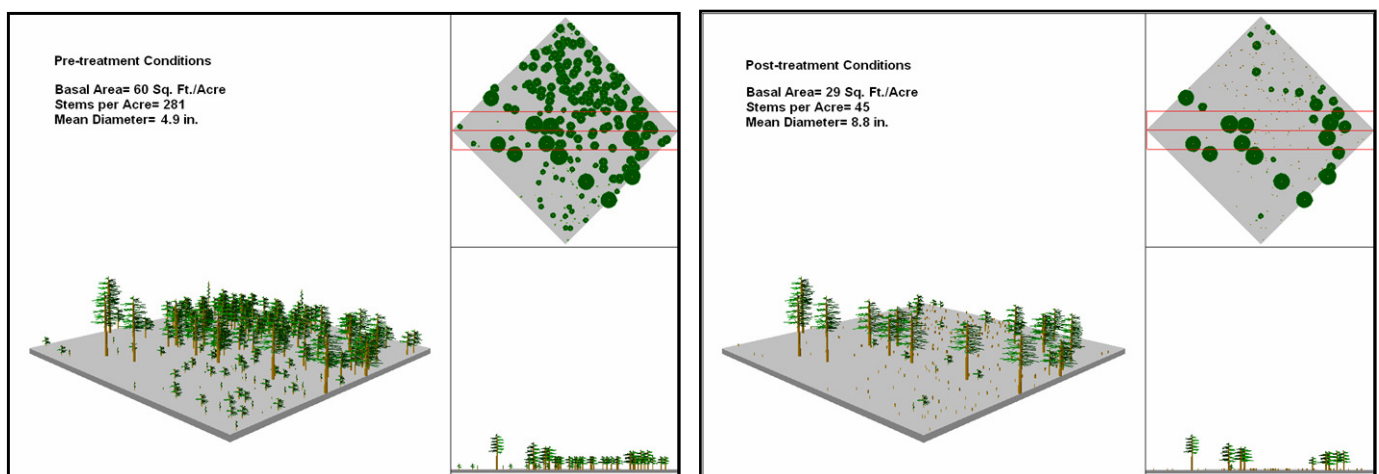


Figure 4- Marshall Mesa overstory structure change due to treatment

The resulting stand after treatment is much more open with far fewer small diameter trees per acre. The stand has a much more uneven-aged structure with an equal distribution of trees in each size class (Figure 4). The basal area was decreased by 52% to a stand average of 29 sq.ft./acre. and, on average, over 80% of the trees were removed.

## **2007 FOREST MONITORING PROJECTS**

### **Understory Vegetation Monitoring**

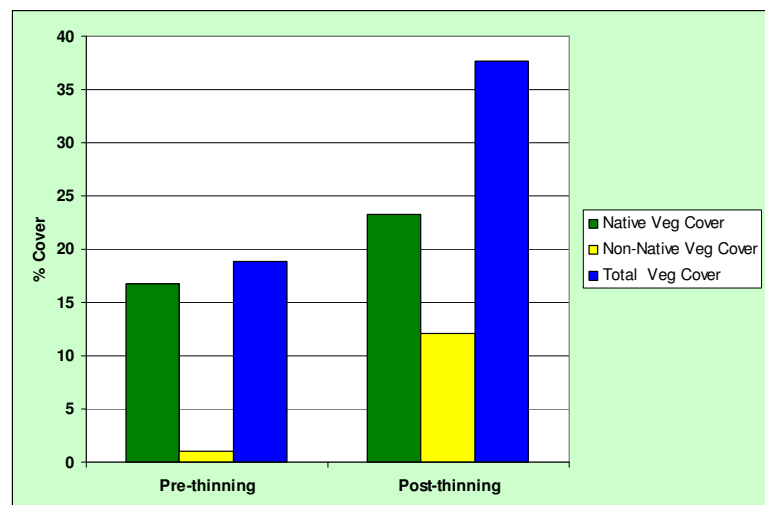
The forest understory monitoring program has been steadily growing over the past five years. OSMF currently has a total of 11 long term vegetation monitoring plots in treatment stands (Table 2). These plots follow a Modified Whittaker methodology and are sampled on an annual basis. The sampling is stratified by treatment type (Thin, Burn, and Thin/Burn) and plots are sampled at least one season before thinning takes place and then annually post thinning. Approximately 12 days were spent by a crew of 2 setting up and sampling the 11 forest vegetation plots in 2007.

**Table 2- Long-term forest vegetation monitoring plots**

Stand	Plot Name	Treatment Type	Years Sampled
S3	S3 MW1	Thin/Burn	03, 05, 06, 07
	S3 MW2	Thin/Burn	03, 05, 06, 07
	S3 MW3	Thin/Burn	05, 06, 07
LJC-SE	LJC-SE MW1	Thin	06, 07
	LJC-SE MW2	Thin	06, 07
LJC-NE	LJC-NE MW1	Thin/Burn	06, 07
	LJC-NE MW2	Thin/Burn	06, 07
S-10	S-10 MW1	Thin	07
Pwrlne	Pwrlne MW1	Thin	07
Wtrtnk-S	Wtrtnk-S MW1	Burn	07
	Wtrtnk-S MW2	Burn	07

At the end of 2007, a total of 5 plots had before and after treatment data collected for analysis (sampled subplots= 50). None of the plots were burned in 2007 but some initial analysis has been done on the pre and post thinning numbers.

Thinned areas show a statistically significant increase in vegetation cover after thinning (p value<0.001; Wilcoxon signed ranks test). Cover increases are significant in both the native and non-native vegetation categories (Figure 5). At this point the data only represents the understory response after one growing season but future monitoring will expand the data



**Figure 5: Average cover values for understory vegetation sampled before and after thinning.**



to multiple years following treatments. This will give a longer term indication of understory response.

Understory response and vegetation cover are important management objectives in the Forest Ecosystem Management Plan. The plan has a number of goals focused on maintaining and increasing native vegetation cover and species richness as well as minimizing non-native cover. Initial data analysis shows that thinning is meeting the goals of increasing vegetation cover but also shows an increase in non-native plant growth. The majority of the non-native cover increase is due to the increase in annual non-native grasses like cheatgrass (*Anisantha tectorum*), rattlesnakegrass (*Bromus briziformis*), and Japanese brome (*Bromus japonicus*). There were very few OSMP high priority weed species sampled in the monitoring plots. It will be important to continue monitoring these sites to determine if the increase in non-native cover is a temporary spike due to ground disturbance and if natives will replace the non-native populations or if it will be an expanding problem into the future. Close monitoring, weed treatment, pre-treatment weed mapping, and changes in management methods will continue in 2008 to minimize the spread of non-natives.

## Forest Wildlife Monitoring

Like the understory monitoring, wildlife monitoring in the OSMP forests has been steadily increasing over the past years. In 2007 staff made progress towards developing and implementing a number of studies started in 2006. In early 2006 staff began monitoring the effects of thinning on bird community composition and brown-headed cowbird abundance in forest stands. Staff also initiated a new study plan in 2006 that carried over to 2007 to look at the effectiveness of snags and snag density for wildlife habitat. Both of these studies will continue in 2008.

The brown-headed cowbird research expanded in 2007 to become a cross boundary collaborative effort with Boulder County Open Space. Ten plots were added at Heil Valley Ranch to increase the study's sample size to 50 sites. The collaboration was very beneficial in that it added additional treatment samples to the project that were not available on OSMP lands. All of the bird sampling on Heil was done by county open space staff. OSMP staff spent approximately 30 days between April and July sampling the study sites on OSMP a total of four times each.

The results of OSMP's bird monitoring in thinned and unthinned stands were presented at the annual American Ornithologist's Union meeting in 2007. After a year of sampling, the data shows an increase in a number of forest bird species in thinned stands including nest parasitizing brown-headed cowbirds (Figures 6 and 7). The results suggest higher overall productivity after thinning for several forest bird species, but also show the potential for increased nest parasitism

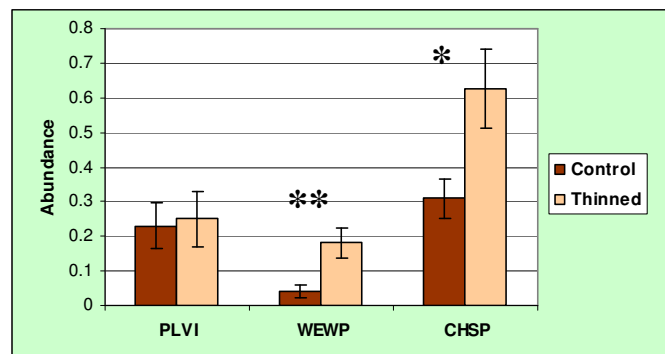


Figure 6: Change in mean abundance ( $\pm$ SE) of three forest songbird species; Plumbeous Vireos, Western Wood Pewees and Chipping Sparrows

\*\* = significant at  $\alpha = 0.01$ ; Wilcoxon Ranked Sums

\* = significant at  $\alpha = 0.05$ ; Wilcoxon Ranked Sums

due to the increase of brown-headed cowbirds. It will be important to monitor trends in wildlife response to thinning in order to determine the effectiveness of treatments and to possibly make adjustments in management. This project will continue in 2008 on both city and county properties.

Another wildlife project that was started in 2006 and continued in 2007 was a research study looking at snag density and snag creation techniques in treatment areas.

Large standing dead trees are important to many wildlife species and the creation of snags through mechanical means is a management goal in most treatment areas.

The project is designed to experimentally investigate the best methods for creating snags and to monitor bird use in newly created snags. In 2007 the study plan was finalized and some initial sampling and mapping took place. This project will carry over to 2008 and will be implemented by the forest management crew in previously treated stands on Lindsay, Shanahan, and Flagstaff. This research will drive management by defining the most effective and efficient methods for creating snags and give some indication of the level of snags required for effective wildlife habitat.

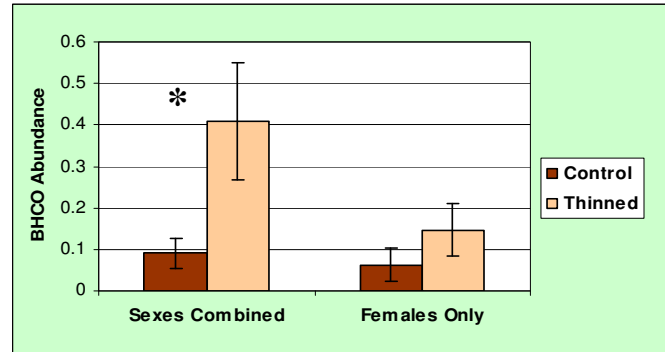


Figure 7: Change in mean abundance ( $\pm$ SE) of Brown-headed cowbirds in thinned and control stands  
 \* = significant at  $\alpha = 0.05$ ; Wilcoxon Ranked Sums

## Overstory and Photo Point Monitoring

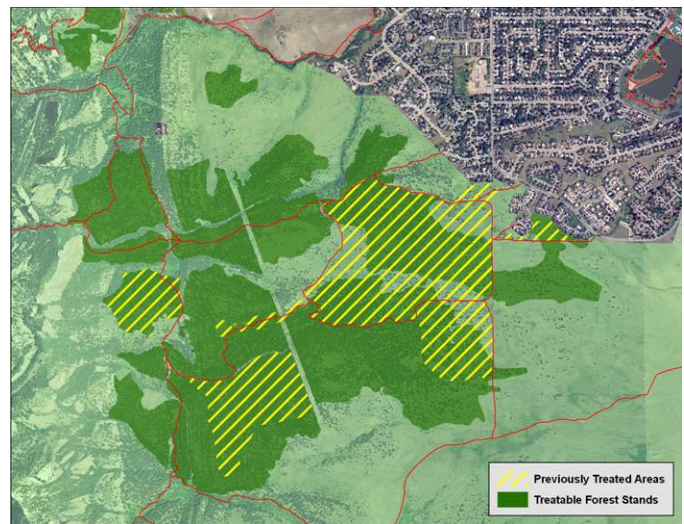
Monitoring of forest stand structure and composition is done with permanent photo points and overstory inventories. Photo points have proven to be an effective way to show differences prior to and following treatment. While they are less quantitative than other forms of monitoring photos can be useful in displaying changes in tree density, understory density, and non-native composition. Across the three projects completed in 2007, 31 permanent photo points were established. Each point was GPS'd, marked with a tree tag, and the direction of the photos was recorded. The photos for the three completed projects are attached to this document as Appendix A.

Quantitative data is collected by overstory inventories. OSMP has 337 inventoried forest stands with 2125 sample points. In 2007, overstory inventories focused on treatment areas and new properties in the Bison Dr. area. Overstory inventories were completed post management on both Marshall Mesa and the Flagstaff area. The post management inventories included measurements of tree characteristics and understory composition as well as qualitative assessments of fuel loads, wildlife habitat, and non-native plant establishment. The values collected by the post management inventories are summarized in the "2007 Thinning Projects" section of this report. Three new overstory inventories were also completed on the Jack and Miller properties that were recently purchased by OSMP.

## **2008 WORKPLAN**

The 2007 season was the fourth year in a row that treatment acreage increased. The goal in 2008 will be to continue this trend for thinning projects and continue to make progress towards making prescribed fire a more consistent and reliable management tool. Monitoring will also continue and expand in 2008. There are a number of departmental goals for 2008 that are directly related to the Forest Ecosystem Management Plan. The development of conservation targets in the forest will parallel the development of the Grassland Management Plan and will be a high priority for the first quarter of the year. The West Trail Study Area process will also start early in the year and focus on recreation and visitor use issues in the mountain backdrop.

Much of the planned management in 2008 is focused in the Shanahan Ridge area east of the Mesa trail. There are close to 400 acres of treatment in this area outlined in the FEMP that have yet to be started (Map 2). Much of the burning planned for 2007, also in the Shanahan Ridge area, will be carried over to 2008 (Watertank and S-3). Thinning will be a combination of fire mitigation projects along the northern edge of the area adjacent to the Devil's Thumb and Shanahan Ridge neighborhoods and shifting more to a restoration focus as crews work south and west. This will be a high visibility project area and public outreach will be important. Interpretive signs, website updates and letters to the neighbors will be used to educate the public on the benefits of forest management.



Map 2: Treatable forest stands in the Shanahan ridge area

One of the main benefits of thinning on Shanahan and OSMP in general is the increased vigor and health of the forest. These benefits and education of the public will be very important in the coming years as the Front Range faces a bark beetle epidemic. Most researchers agree that in the next 3 to 5 years areas along the Front Range will start to experience beetle outbreaks similar to what has occurred on the western side of the divide (Figure 8). One of the few mitigation techniques for beetle outbreaks is to increase the health of forest stands through thinning and burning before beetle populations begin to increase. While it's unknown exactly how the beetles will behave in the ponderosa forests of the Front Range, the consensus is that there will be at least some mortality in large patches across the landscape.



Figure 8: A lodgepole pine stand infested with mountain pine beetles

Beetles will become an important part of forest education in 2008. The process of developing a message for beetle management has already begun and a number of agencies including the US Forest Service, the State Forest Service and county and local governments have been involved in roundtable discussions to develop messages and action plans for the future. OSMP will work to incorporate beetle education into outreach opportunities and the website in the coming year.

## **REFERENCES**

- City of Boulder. 1999. City of Boulder Forest Ecosystem Management Plan, Part 1, June 1999. City of Boulder Open Space Department, City of Boulder Mountain Parks Division, and City of Boulder Wildland Fire Division, Boulder Fire Department.
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